The
MONTHLY REVIEW

Published Monthly by the
American Electro-Platers' Society

A SOCIETY FOR THE ADVANCEMENT
OF THE
SCIENCE OF ELECTRO-PLATING

NOVEMBER, 1922

v.9 #11

Entered as second-class matter, September 26, 1922, at the Post Office at Oneida, N. Y., under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of October 3, 1917, authorized September 26, 1922.

Copyright, by American Electro-Platers' Society

KRESGE-HOOKER
SCIENTIFIC LIBRARY
DEC 10 1947

EXECUTIVE BOARD, A. E. S., 1922-1923

President
Walter J. Allen, 451 Norwood Ave., S. E., Grand Rapids, Mich

First Vice-President
B. D. Aufderheide, 635 Kentucky Ave., Indianapolis, Ind.
Second Vice-President
J. E. Garrick, 94 Roberts St., Attleboro, Mass
Secretary-Treasurer
Frank J. Hanlon, 216 N. Jefferson St., Chicago, Ill.
Past President
Philip Uhl, 2432 N. 29th St., Philadelphia, Pa.

Editor
F. C. Mesle, 166 Willow Place, Sherrill, N. Y.
Associate Editor
Dr. W. Blum, Bureau of Standards, Washington, D. C.
Joseph Hass, Jr., 211 South High St., Muncie, Ind.

To Branch Officers and Members:

By request of our Editor, Mr. Frank C. Mesle, for an executive ruling in regard to certain papers that had been printed in THE REVIEW, the following questions were submitted to the members of the Executive Committee, vix.:

First—Was it in strict accordance with the Constitution of the A. E. S. to print Mr. Humphrie's article in THE REVIEW?

Second—Is it in strict accord with the Constitution of the A. E. S. to present similar matter at a regular Branch meeting?

Every member of the Executive Committee voted in the negative on both questions; therefore I direct that all matter submitted to the Editor must be entirely free from reference to proprietary names and from personal criticism.

I also rule that it is not constitutional to permit such papers to be read at regular meetings of the Branch Societies.

Yours very truly,
WALTER J. ALLEN,
Supreme President.

MONTHLY REVIEW

Published by the

American Electro-Platers' Society

ONEIDA, NEW YORK

Editor's Office, 166 Willow Place, Sherrill, New York

VOL. IX NOVEMBER No. 11

EDITORIAL

A PLEA FOR GREATER ACCURACY IN HANDING OUT PLATING INFORMATION

It is amusing at times to read in trade journals the answers that are sometimes given to questions that are asked by platers who evidently are having trouble and need information. While it is amusing it also has a very serious side, especially to the plater who is having trouble and who seeks information from what he considers an authentic source, only to find that as he tries to follow the instructions given, he still has his troubles with him, and in greater proportion at times, but one thing he has lost and that is his faith, confidence and respect for the opinion of the so-called expert whose information developed to be misinformation, and this is especially serious when the expert is a member of the A. E. S.

Another very serious side is that the trade journals are read by factory managers and superintendents who are keen to improve their plating quality and to increase production, yet have little knowledge of plating problems but assume, of course, that experts who write in trade papers give accurate information, and frequently request their plater to do some of the fool things suggested in trade papers. If the plater fails to make a success of the thing suggested, the manager or superintendent is likely to think that the plater is lacking in ability, because the expert says it should be done "so and so."

Managers and superintendents who read the article referred to below will be asking their platers why it takes

them from 40 minutes to an hour (or more) to plate 12 dwt. knives when it can be done in 12 minutes, according to a well-known authority, etc., and yh they have a solution with 3 to 5 ounces of metal when 2 ounces is enough to plate at above speed.

It is our interest in the reputation of the A. E. S. and its members that has influenced the writing of this plea for greater care and accuracy. We will take as an example the question asked by a plater who evidently is having trouble plating knives, and the answer as given in a recent issue of a trade paper. In the answer the following formula for solution was given:

Water	1	gallon
Sodium Cyanide ...	3	ounces
Silver Cyanide, 80%	2½	"
Carbonate of Potash	1	"
Brightener	1	to 2 drops

and with this solution recommended the use of 12 amperes per half-dozen knives, or 24 amperes per dozen or plating a vat of knives with 14 dwts. of silver per dozen in 13.5 minutes. It was also suggested that a bright or skim-milk color is best plate for knives."

It occurred to us when reading this that if the plater carried out these instructions he would be plunged deeper into trouble than before, because the answer is **impossible**. In our opinion knives cannot be plated in above solution with 14 dwt. of silver in less than that many minutes, or at the rate of 24 amp. per dozen knives with ordinary temperature and agitation. But not trusting our limited knowledge we sent the following questions to 12 different platers who are now plating knives, or who have all had experience in knife plating (all members of the A. E. S.):

(1) Do you believe that knives can be plated in the above solution at the rate of 24 amperes per dozen, with ordinary temperature and agitation?

All answered No.

(2) If not, what amperes per dozen would you recommend?

One and one-half to 10 amperes—average 5 amperes per dozen.

(3) In your judgment, what is the better plate for

knives, the "clamshell white" or a "blue skim-milk" color deposit?

Two blue—10 clamshell white.

In answering the above questions most of the platers stated the amperes they were using per dozen knives rather than the amperes that should be used for the solution mentioned above, and we assume that most platers are using a solution with more than two ounces of metal per gallon. The average amperes per dozen given in the answers to No. 2 question, therefore, is high for a two-ounce solution—25% less amperes would come nearer the practical current density to use. It is impossible to state definitely the current that should be used in a certain type of silver solution because other factors must be considered, such as temperature, agitation, and the relation of the anodes to cathods in square area, distance and position in vat.

The jury of 12 platers to whom the matter under discussion was submitted, stated that knives **cannot** be plated with a current of 24 amperes per dozen, in the solution suggested—that 5 amperes per dozen is more nearly correct. Or, instead of plating 14 dwt. knives in about 14 minutes, it requires about an hour, which is some difference in a day's output.

It should also be noted that 10 of the 12 platers who answered, noted that a clamshell white is a better plate for knives than a blue skim-milk color. This is largely a matter of opinion and the method used in finishing the knives, and the plater may take his choice, but he has no choice when it comes to using 24 amperes per dozen knives in a solution as suggested. The jury says it **can't be done.** We do not call in question the ability of the men who write for the trade papers, but we say that more care and accuracy should be used in handing out information that is so vital to every plater, and means so much to the A. E. S.

COPPER PLATING FOR CARBURIZING AND HARDENING

R. E. Maeder

The affinity of iron for carbon is so great that when iron or steel is heated to a sufficiently high temperature in con-

tact with some suitable carbonaceous material, it absorbs carbon. This fact is taken advantage of in carburizing and hardening to obtain a part, or piece of mechanism which has a hard, wear-resisting surface and yet retain the soft ductile core of mild steel.

The process of carburizing and hardening may be briefly described as follows:

The stock is packed in pots with the carbon bearing material—charcoal, bone, coke, cyanide compounds, and various carburizers sold under trade names, consisting of these materials combined with so-called energizers such as barium carbonate, etc., and heated to the necessary temperature for a necessary duration of time. The temperature and time required depend upon three things:

1. The depth of carbon penetration required,
2. The composition of the steel,
3. The nature of the carbon bearing material.

Usually a mild steel is used, machine steel, punching steel, screw steel, etc., having a carbon content of not more than .20 per cent. The temperature of most carburizing treatments is in the vicinity of 900 to 950°C. The average depth of carbon penetration used is probably about .020" to .030".

When the required amount of carbon has been absorbed by the steel, the carburizing is complete and the work is either hardened by quenching directly from the pot, or is allowed to cool slowly and then hardened by a subsequent heat treatment.

The mechanism of carburizing: It was thought for many years that in the carburizing of iron, solid carbon passed bodily from the carbonaceous matter into the metal. Recently, however, it has been shown that the transfer of carbon from the carbon bearing material to the iron is accomplished chiefly by means of gases liberated or formed by the high temperature. Carbon monoxide (CO) and volatized cyanogen (CN) componds are the gasses which are conceded to be the most effective. The carbon monoxide is formed by the partial combustion of the carbon in the carbonaceous material, while the cyanogen results from the combination of that carbon with the nitrogen in the atmosphere or from the decomposition of cyanide compounds.

Carbon monoxide gives up its carbon to the iron according to the reaction.

(1) $2CO + 3Fe = {}_3C + CO_2$

The resulting iron carbide or cementite being dissolved by the austinite.

The carbon dioxide liberated from this reaction coming in contact with fresh carbon is again reduced to carbon monoxide,

(2) $CO_2 + C = 2CO$

The first reaction takes place again, more iron being combined with carbon until the surface of the steel or case contains about .90 per cent. carbon. That is until the case is of Eutectoid composition.

It is often found convenient and necessary to localize the hardening on certain mechanisms. (1) Where the part must be strong and ductile, to withstand shocks, and still be hard on the wearing surfaces. (2) Where machining operations must be performed after the part is hardened. (3) Where deformation and warping of the part is likely to take place during heat treatment.

This can be done by several methods in the heat treatment department, with which this paper is not concerned.

It has been discovered that while carbon penetrates into and is absorbed by iron and steel, it cannot readily penetrate metallic copper. Nor is copper acted upon, in any way, by carbon. (The above statement may not be strictly true, but if a sufficiently thick copper covering is present practically no carbon penetrates through into the steel, also the copper comes through the heat treatment practically unchanged).

For this reason carburizing is being localized by covering the steel with a metallic film of copper in many shops. While this method seems to be quite common practice, it has been the author's experience that literature on copper plating for localizing carburizing is woefully scant.

For this reason it was necessary to do some research work onthis method.

Electro-plating is the logical way to cover the steel with a coating of metallic copper. After copper plating the parts the copper is removed by machining, from the portion of the part where carburizing and hardening is required,

leaving the localities which are to remain soft, protected with copper.

There are two points in this method which give us considerable trouble: (1) The minimum thickness of copper necessary to unfailingly prevent carbon penetration. (2) A simple, convenient method for determining in the plating room, the thickness of the copper deposit.

Also, the plating methods and solutions to be used are of importance from a production standpoint, and in obtaining a satisfactory deposit for this class of work.

It was necessary on account of the close limits in the product to determine the minimum necessary thickness of copper deposit. This was done by copper plating test pieces of the kind of steel most generally used, with varying thicknesses of deposit. The thickness varying from .0001" to .0010". A considerable number of these test pieces were plated and then carburized and hardened by the methods to be used in heat treating production parts. It was found that a mild 10 to 20 point carbon steel, copper plated with a deposit .0005" thick remained soft enough to machine easily after being heat treated.

Methods of Plating: Where large quantities of small parts are o be treated, the most convenient and least expensive method of copper plating is barrel plating. Barrel plating gives a much more uniform deposit than any other method. For localizing carburizing and hardening, barrel plated copper was found to be far superior to still tank plating. The success of this method of plating is due to a great extent to the dense, compact plate obtained, by the burnishing effect of the pieces rolling against each other in the barrel.

However, there are some parts that cannot be plated in barrels. Among these are parts that are too large, or parts that would be injured by barrel plating, or parts that, due to their shape, cannot be successfully plated by this method. For these parts, wiring and racking must be resorted to. Also, parts on which localized copper plating is necessary must be waxed and wired, or plated in localizing plates.

The solutions used for this work were, wherever possible, cyanide copper. There are two main reasons why

cyanide solutions should be used for this work: (1) The cyanide copper solution does not attack iron to any appreciable extent. (2) The well known superior "Throwing Power" of cyanide solutions make them invaluable where it is of supreme importance to obtain a required thickness of deposit in holes and irregularities.

But where it is necessary to wax the work to localize the copper plate, cyanide solutions cannot be used on account of the action of cyanide on the wax. For this kind of work acid copper is resorted to, striking the work in nickel to protect the steel from the action of the sulphuric acid.

On account of the large cathode area obtaining in barrel plating, as compared to the annode area, a heavy solution of copper cyanide was used. These solutions were made up originally to contain 7 ounces per gallon metallic copper and 5 ounces per gallon free sodium cyanide.

In making up the solution, 10 oz. per gallon of copper cyanide (70 per cent. of copper) and 13 oz. per gallon of sodium cyanide were used. No conducting salt was added. This solution had a specific gravity of 15.2°Be', and analyzed, 5.1 oz. sodium cyanide per gallon, and 6.8 oz. copper per gallon.

The solutions were built up frequently, depending on the volume of the work, with copper cyanide and sodium cyanide in the proportion of 10 to 7 respectively.

The solutions used for still tank plating were of the average composition of:

1¼ oz. per gallon copper,
1½ oz. per gallon sodium cyanide (free)

The temperature used for both barrel and still tanks was about 120°F. However a temperature of 200°F can be used successfully.

The current used on the barrel tanks was about 5 to 6 amperes per sq. ft. cathode surface at a pressure of 7 to 8 volts.

On the still tanks a current of about 10 amperes per sq. ft. was used at a pressure of 3 to 4 volts.

The solutions were controlled by chemical analysis. Samples were taken at definite intervals and the composition of the solution adjusted by the addition of copper

cyanide and sodium cyanide. The time required to obtain a sufficiently thick deposit was about 1½ hours.

One difficulty encountered in the operation of the barrel tanks was the sodium carbonate formed by the excessive breaking down of the cyanide in the solution. It was found advisable to discontinue the use of a solution after the carbonate had built up to about 25 ounces per gallon. This accumulation of sodium carbonate cuts down the efficiency of the solution to a considerable extent.

The current efficiency of a solution high in carbonates was determined as 65 per cent., while a newly made up solution gave an efficiency of 92 per cent.

In copper plating for carburizing under conditions, where it is impossible, on account of the narrow machining limits allowed in the manufacture of the product, to put on a very thick deposit, which is, I believe, the common practice, it is imperative to have some method of determining the thickness of the plate in the plating room. This method must be one that is capable of being used quickly and accurately by the practical plater who is doing the work. He must, under conditions prevailing in our factory, test each lot of work plated and remove it from the bath when the thickness of the deposit is between certain definite narrow limits.

The method used was one developed by us to meet these conditions. The method consists of placing a drop of nitric acid of a definite strength (1:1) on the copper deposit and noting the time in seconds necessary for the acid to eat through the copper and attack the steel. The end point is definite; as the brown color shows up, in contrast to the bluish white, immediately the steel is attacked. It was found by tests run on pieces of steel which were very accurately measured with micrometers, at a marked point, and measured and tested with acid after plating, that each 10 seconds required by the acid to eat through the copper was approximately equivalent to .0001″ thickness of deposit. The required minimum deposit of .0005″ is represented by this test, by a time of 45 to 50 seconds for the acid to eat through the copper to the steel. This method is simple, convenient, and accurate enough for all practical purposes.

By following the above outline closely and by rigid control and inspection on the copper plating and the heat treating we are encountering very little trouble in localizing carburizing and hardening.

PLATING NICKEL UPON A ZINC DEPOSIT

By J. Andrew Warner

This article deals with the results obtained after a year of experience on the part of the writer in plating automobile bumpers. We will not attempt to describe methods that have been discarded in the course of this time, but will try to deal only with methods that have proven satisfactory.

The bumpers which are made of carbon spring steel are heated and bent to the proper form, then tempered, leaving a heavy scale which is removed by placing them in a warm sulphuric pickle. This pickling solution removes the scale in from an hour to an hour and a quarter. The bumpers are then rinsed in cold water and placed in hot water, into which has been dissolved three ounces of tri-sodium phosphate to the gallon; this is for the purpose of neutralizing any acid that might cling to the work from the pickling vat. Here it is left for five or ten minutes, then it is ready for the polishing room.

The bumpers are roughed out on sixty emery and after fining on various finer emerys, are finished on 220- bull neck oil wheels, and colored on felt wheels with 6-A. emery.

The bumpers are then placed on racks holding two bumpers each, which compose nine square feet of plating surface and cleaned in an electric cleaner composed of four ounces of soda ash, two ounces of tri-sodium phosphate and one-half ounce of caustic soda per gallon, and is connected with a double throw switch; from here they are rinsed and transferred to the zinc.

In describing the plating which will follow, the writer will try to go into detail, as in plating we all know that it is the little things that count.

We are using a cyanide zinc solution, at a temperature of 120 degrees F. and give a hydrometer test of 30; the tank is wired direct; no rheostat is used. At 50 amperes per square foot a fairly heavy deposit is obtained in two or three minutes. In regard to the upkeep of this solution the problem of keeping the anodes clear when the solution is in constant operation is difficult. In order to keep the anodes as clean as possible, plenty of caustic soda is used. In a solution kept at this temperature, this caused anode corrosion to an alarming degree, but we found this would be over-

come by replacing some of the zinc anodes with steel anodes. By this method the metalic contents can be regulated by the amount of steel anode surface used. Should the zinc deposit become rough, ammonium chloride is added; gum arabic improves the color and also aids in obtaining a smooth deposit.

The bumpers are taken from the zinc tank, rinsed in cold water and placed directly in the nickel tank. What this solution was originally composed of the writer is unable to state; it appeared, however, to be an ordinary nickel solution, consequently unfit to plate over zinc.

Nickel carbonate was added until the solution stood neutral or nearly so. Three ounces each of sodium chloride, magnesium sulphate and ammonium chloride to the gallon was added. Two parts nickel chloride to one part sodium citrate was added until the solution which originally stood 6 Beaume, now stood 14. From this point on nickel chloride is used monthly. Sodium citrate should be added occasionally; double nickel salts can be added now and then. Nickel carbonate should be added from time to time to take up the acid in the solution.

The anode rods were moved close enough to the cathode so work suspended in the solution was approximately five inches from the anodes. Intense agitation by means of an arm, one end of which was connected with an eccentric above, the other end attached to one of the cathodes (this tank is a double tank), the cathode rods are connected at each ends by cross-pieces, the center of each works on a bearing. When in operation the arm has a stroke of six inches at a speed of 30 revolutions per minute; this not only gives the work a vertical motion but a rolling one as well.

This tank is lead lined and kept at a temperature of 90 to 95 degrees F. by means of a lead coil. Work should not be plated in this solution under these conditions in cold weather without first warming the solution, as the work will peel. Care also must be exercised so as not to allow the solution to become too warm, as the acid in the solution becomes more apparent as the solution is heated.

This tank is also wired direct and is run at 30 amperes per square foot and plates so rapid that a five-minute plate will stand a heavy buffing on an eighteen-inch buffing wheel.

ELECTRO-PLATERS' MANUAL

By Joseph Haas, Jr.

INTRODUCTION

The amount of electro-plating literature published every year has rapidly increased, not only through journals given to the publication of plating literature, but also through the efforts of the American Electro-Chemical Society and the Bureau of Standards. It is ordinarily difficult for the plater to gather all this literature and extract what is of use to him, so that he can have it at a moment's command. Much valuable material is consequently of little use, because it is so widely scattered, and therefore the same as if it had no existance.

These data have been gathered to overcome these difficulties. The numerical and chemical data will be of great value to those who experiment and apply chemical principles to their daily work. All numerical data, tables, etc., are listed from the latest obtainable scientific data, so it is hoped that there are no errors. If any errors exist, they have been unavoidable, and it is hoped that anyone detecting errors will report them to the author, so that corrections may be made.

All standard publications have been gone over from the year 1900 and listed under the various solutions and a summary given. In this way a plater seeking a review on any particular subject will have it on hand and know where to find the original complete article. Data in all cases do not include personal opinion, method or practice, but represents the general opinion in the plating trade.

In gathering data the author has found that much that would be of value, and practical application, impossible to obtain, due to a lack of knowledge, controlling conditions and differences of opinion. Consequently many vacant spaces are left to be filled in by individual needs.

Formulas

The use of a little arithmetic is necessary to every plater, so that below is given that which he is sure to find useful:

π is a factor that is numerically equal to 3.1416

$\frac{1}{\pi} = 0.3183 \qquad \frac{1}{4\pi} = 0.07958 \qquad \frac{1}{2\pi} = 0.15916$

I Circumference

1 Circle:—radius—r $\quad C = 2\pi r$

II Area.

1 Square:—side—"a" $\quad A = a \times a = a^2$

2 Rectangle:—sides—"a" and "b" $\quad A = a \times b$

3 Trapezoid:—parallel sides "a" "b", altitude "h" $\quad A = \frac{1}{2}(a+b) \times h$

4 Triangle:—base—"b"; altitude—"h" $\quad A = \frac{1}{2} b \times h$

5 Circle:—radius—"r"; circumference "c" $\quad A = \pi r^2 = c^2 \times \frac{1}{4\pi}$

III Surfaces.

1 Cube:—edge—"a" $\quad S = 6a \times a = 6a^2$

2 Cylinder:—radius—"r"; height—"h"; circumference—"c" $\quad S = 2\pi r \times (h+r)$

$S = c^2 \times \frac{1}{2\pi} + ch$

3 Sphere:—radius—"a"; "c"—circumference $\quad S = 4\pi r^2 = c^2 \times 1$

4 Segment of a Sphere:—radius "r"; height "h" $\quad S = 2\pi rh$

IV Volume or contents in U. S. Gallons.

In the calculations of volumes it is more convenient to have all measurements in inches.

1 Cube:—edge—"a" $\quad V = \frac{a^3}{231}$

2 Rectangular tank: sides—"a" and "b"; height—"h" $\quad V = \frac{a \times b \times h}{231}$

3 Cylinder:—circumference—"c"; radius "r"; altitude—"h" $\quad V = \frac{h\pi r^2}{231} = \frac{hc^2 \frac{1}{4\pi}}{231}$

4 Barrel:—diameter at the head—"d_1"
" " " bung—"d_2"
Mean diameter = M—$\frac{1}{2}(d_1+d_2)$
Altitude—"h" $\quad V = M^2 \times h \times 0.0034$

THE GUESSERS

A Buffer went forth to buff one day,
And he buffed and buffed in his own darn way,
He remarked in accents scornful and rough,
There's no living man that can teach me to buff,
But he got some work caught and caught right mean,
And it smote him viciously right on the bean,
And this vain buffer said in accents of pain,
I'm going to learn buffing all over again.

A Polisher went forth to polish one day,
And he polished and polished in his own darn way,
For often he boasted that about polishing
There's nary a man that can teach me a thing,
But that very night found him sad and dejected,
For all of his work that day was rejected,
And he gloomily said to himself, "Goldurn,"
There are things about polishing I still got to learn.

A Plater went forth to plate one day,
And he plated and plated in his own darn way,
For he'd always made good, so he said, said he,
I know all about plating from "A" to "Z,"
But this man's conceit was due for a fall,
For his plating that day was no good at all,
And he threw all the dope in his tanks that he durster,
But his plating got worser and worser and worser.

For this Plater who went forth to plate that day,
Maintained his solutions in his own darn way,
And he guessed at things, though he kept it "mum."
And maintained his solutions by the rule of thumb,
He had always succeeded as he plated along,
But this time he had guessed and guessed all wrong,
So Now he has joined the "A. E. S.,"
And he's trying to learn so he won't have to guess.

—Hedley J. Richards.

BRANCH NEWS

Philadelphia Branch

The regular monthly meeting of Philadelphia Branch was held Friday, November 3, with President Gehling in the chair and a good attendance. One applicant was elected to membership. Banquet committee reported progress and a good time guaranteed. Discussion of the evening, Silver Plating Die Castings and what will prevent electric sockets from staining. Tumble in sawdust or immerse in a solution of gelatine dissolved in hot water.

Bridgeport Branch

Open meeting held on October 20 at the Singer Recreation Rooms. Professor Bahney gave us a very interesting talk on Copper From Mine to Ingot. The attendance was very large. Regular meeting held on November 3, with 22 members present.

Mr. Oberender gave us his report on the 1923 convention. We had with us several members from Waterbury Branch. Our next open meeting will be held on November 17. We have arranged to have Mr. Amos Bissell talk to us on Japans, Enamels and Wood Finishes on Metal.

Mr. Bissell is an authority on this subject, and from all reports we expect to have a very large attendance.

Detroit Branch

Regular meeting of Detroit Branch held November 3, 20 members present. Vice-President Miller presided, President H. Phelps being absent. Secretary expresses his thanks for the increasing attendance of members and prompt payment of dues. It is certainly gratifying, and he expects to see Detroit set a mark for attendance and educational advancement for the others to **shoot at** and **fail to hit.**

Communication from Cleveland Branch advertising M. G. Kopf's lecture received and filed; also one from Metal Industry for mailing list of members complied with; secretary also inclosing one to Supreme Editor for his files.

Committee to secure meeting place: H. D. Brockway, chairman; T. C. Eichstaedt, A. T. Wagner, A. J. Fritz; last but not least, P. (Paddy) Bergin.

Frank Powers of Sarnia related some of his experiences that were very interesting. It shows our out-of-town members are not asleep.

Discussion on cadmium plating: Experiments by H. S. Brockway showed that parts cadmium plated and buffed; then nickel plated and buffed exposed, did not rust, while other cadmium plated, not buffed, then nickel plated and buffed, also exposed, did. From these experiments it would show that porosity of cadmium deposit was eliminated by buffing, previous to nickeling, allowing no corrosion of the parts. Here is food for thought and research.

A. E. Shepherd related of steel radiator shells peeling on the inside when coated with nickel, due to material being Terne plate. He was advised to remove the lead previous to polishing by the use of caustic soda

or nitric acid, as cleaning by electric cleaner might cause film of lead to deposit on polished surface previous to nickeling.

T. C. Sichstaedt submitted iron knobs that had been sherradized, or electro galvanized, that were o be nickel plated. When advised to copper strike, he stated he used that method with good results.

Ben Miller submitted die-cast tonneau handles with a new finish, sand blasted first, high lights buffed, then bright dipped and nickel plated. They were beautiful.

Attendance large and enthusiastic. Meeting adjourned until December 1, 1922.

New York Branch

Our regular meetings were held on October 13 and 27, President Morningstar presiding.

At our October 13 meeting Mr. Scott and Mr. Trout of Philadelphia Branch were visitors. Mr. Scott reminded the members of the coming Philadelphia banquet on November 25. He wished for a large number of New York members to be present.

At the October 27 meeting, Mr. Oberender favored us with a visit; also reminded the members of the coming convention at Providence, R. I. A member showed some fine samples of barrel plating in the following finishes: Zinc, copper, tin, nickel and brass; the articles were highly finished; work was not tumbled after plating. The formula given for zinc plating for barrel was 4 lbs. zinc sulphate, ¼ lb. aluminum sulphate, 1 gal. water 34°B. 5 volts, work to stand salt water test. The following formula for a cheap copper was: Make a solution of 4 gals. water, ¼ lb. cop. sulphate, 2 ozs. sodium chloride, 6 ozs. sulphuric acid, ¼ lb. iron nails, place in barrel and run work until it begins to brighten; copper is now all deposited. If a dull finish is desired, take out before it starts to brighten. Work can be oxidised by polysulphide and relieved by this method. The member stated he oxidised his work in a barrel, using ¼ oz. polysulphide to 1 gal. water and run until the desired color appears.

A number of members wish to know where the phonograph needles went.

Montreal Branch

The Montreal Branch of the A. E. S. is now erecting their own laboratory at 48 Craig West. We find it is quite a job to erect it correctly. So, as we are far behind the well-advanced branches of our American conferees we would like to ask all members of A. E. S. to furnish us some advice as to how they did proceed in their beginning. Every information would greatly help us. We have had a generous response from Mr. Charles Kemish of the Toronto Branch, and would appreciate very much all that the American branches could devote in our favor.

Newark Branch

Report of special meeting September 29, 1922, called by the President, O. J. Sizelove, for the purpose of forming the chemistry class, thirty members having signified their intention of joining the class. There

were 19 present, with two visitors from New York Branch. The laboratory committee announced that a room, No. 29A, in the Newark Technical School, with laboratory facilities, had been secured free of charge for Tuesday evenings only. In view of the fact that the room was secured gratis the original fee of $10 tuition was cut down to $5. The book, "Talks to Platers," by Dr. F. C. Stanley, published by Bridgeport Branch, A. E. S., will be used by Instructor Sizelove during the year when the analysis of plating solutions is begun.

The secretary was instructed to purchase 20 copies of "Talks to Platers" for the members.

The Laboratory Committee's report was accepted and it was voted that we begin the study of chemistry and the analysis of plating electrolytes on Tuesday evening, October 3, in the classroom laboratory at the Technical School.

Mr. Charles H. Proctor was present and spoke of the favorable strides Newark Branch is making toward the education of its members along the chemical line and congratulated us upon the step we had taken.

Newark Branch held its regular meeting on Friday, October 20, with O. J. Sizelove, president, in the chair, 15 members and one visitor being present. Mr. Frank Dressel and Mr. Peter Labash were elected to active membership. The Laboratory, also the Banquet Committees, reported progress.

Librarian Mr. Faint read from the MONTHLY REVIEW parts of the article, "Purity of Nickel Salts," after which a discussion took place upon the same. The question was asked, "How can iron be eliminated from a nickel solution?"

At our next meeting in November the copper sulphate solution will be discussed in all its phases. Meeting adjourned at 10:40 P. M.

Newark Branch held its November 3 meeting at 17 Central Avenue, with President O. J. Sizelove presiding, 14 members and one visitor being present.

Mr. S. Glickenhaus spoke upon his method of using the acid copper solution for his class of work, using a strike solution first, which has a low metallic copper content and a high H_2SO_4 acid content, then transferring articles to the regular copper sulphate solution.

Mr. O. F. Carlson spoke on his trip through the Armour Bronze Co.'s copper depositing department, where very large articles made of plaster Paris are metalized by being copper plated in a copper sulphate solution from 36 to 48 hours. Royal F. Clark described his method of operating one thousand eight hundred seventy nine (1879) tanks of copper sulphate solutions in the matrix manufacturing department at the Columbia Graphaphone Co., Bridgeport, Conn., where phonograph records were made. During every 24 hours about one ton of copper was deposited upon prepared surfaces, which included the wax master record, the mother, and the stamping record matrix. He also described how, in a circular tank, 36 copper shells were turned out in 8 hours; the mother matrix cathodes revolving in the tank, thus agitating the electrolyte.

Electro tin solutions were discussed by Messrs. Sizelove and Schulte. Meeting adjourned at 10:50 P. M.

Chicago Question Box

The Question Box contained the following questions:

Question No. 1—Does anyone know an economical method to clean and nickel lead balls?

Answer No. 1—It was suggested to try tumbling in sal of sodaash cyanide and very fine selica for cleaning; also to try the regular nickel strip for cleaning.

Question No. 2—How can scratches be avoided in ball burnishing? What is correct speed for burnishing either steel or brass?

Answer No. 2—In final burnish use a good load of balls and not so much work and a lot of soap in barrel; barrel run about 55 to 60 revolutions per minute, and in the large globe barrel use about 30 to 40 R. P. M. for good results and nice, clean burnish.

Question No. 3—What is nitre cake made from; how and what is it used for?

Answer No. 3—It is by-product in manufacture of acid and is sodium bi-sulphat and contains about 40% free sulfuric acid. Large concerns use it for pickling, and some stove shops use it in connection with hydroflouric pickle. It does not exclude hydrogen from castings as much as does sulphuric pickle; therefore, is better to use for operator's health.

Question No. 4—What is good metal to make dip baskets out of that is used in strong, hot muratic pickle?

Answer No. 4—Nichrome is good but expensive; nouel metal is also good and not so expensive.

Question No. 5—What is a good formula for white gold?

Answer No. 5—It was thought that a combination of fine gold and cadmium with a little pottasium hydrate would do the trick, but it is very hard to hold the color to a good white.

Question No. 6—Why do we use muriatic acid dip on steel before plating instead of sulphuric acid dip, which is less liable to form a greasy top film standing insld over night?

Answer No. 6—It does not fill castings up with sulphates and unless grease is thoroughly cleaned in caustics there is a liability of soap soponifying on hydrochloric pickle.

Question No. 7—How can you keep nickel hydroxide from forming in tank of mechanical plater?

Answer No. 7—It was suggested not to make solution so dense that 6 volts would not be sufficient current, as high voltage in dense solutions cause this phenomena, and there is no real reason for it. It was also suggested to use fluaborate of mc. solution and never have any chance of this occurring.

Milwaukee Branch

Milwaukee Branch, A. E. S., held its regular meeting Octobr 12, with President R. Goodsell in the chair. Three new applications were received and referred to committee for investigation. Milwaukee Branch has equipped a laboratory for its members and has organized a class in chemistry for the coming winter. Our honorary member, Mr. Krenth, has volunteerd to give us a hand on the night that boys will meet.

Chicago Branch

The regular monthly meeting of Chicago Branch was held this evening, President Bott presiding. We had a fine meeting in view of the fact that it was a legal holiday. Several members from Indiana, two or three from Aurora and St. Charles and one from Racine, and we had visitors from New York, Detroit and Milwaukee and St. Louis. This is some cosmopolitan meeting place. The Chicago Branch spirit prevailed.

We elected one new member, Mr. J. F. Miller, 215 W. Illinois street, Chicago, Ill., and we reinstated one old member, P. J. Carlson, 208 N. Canal street, Chicago, Ill., as active members.

We had with us Mr. Lovering of Detroit Branch, and also a member of the Research Committee, who gave us a nice talk and also a booklet with Mr. Koff of Cleveland lecture on Corrosion, as given by him at Detroit, and it is mighty interesting.

Mr. L. Armour, past president of Milwaukee Branch, gave us a short talk and said he was glad to visit us.

At conculsion of Question Box the librarian called upon our old reliable, Mr. O. E. Servis, past supreme president, to deliver second edition of his Reading on Corrosion from the paper factory as written by Mr. G. A. VanBrunt, and it was mighty interesting and will be concluded at our January meeting or in two more readings if Oscar lasts out that long, as it is very long and requires lots of vocal energy, but nevertheless we surely appreciate it, and the members are very grateful to our Oscar for the service.

The committee headed by E. Lamoureaux as chairman and R. J. Hazucha as secretary to investigate conditions for our banquet reported their recommendations, which were concurred in and the committee was appointed a permanent one with power to act, and have decided to hold our annual on January 19, Friday evening, at Chicago Elks' Club, 174 W. Washington street. Fine quartet and eats, $2.00 per plate, and possible papers by Drs. Watts and William Blum and other notables.

CHICAGO BRANCH QUESTION BOX

Question No. 1—What proves better conductivity in a nickel solution: Sodum chloride or amonum chloride, and in what respects?

Answer No. 1—If same percentage of chlorine is used in adding each bath the same.

Question No. 2—What is cause of die castings tarnishing more readily in coast towns than in inland cities?

Answer No. 2—Chlorine in the atmosphere greater causes this.

Question No. 3—Can small grass pieces be made brush brass other than by hand and get good results?

Answer No. 3—Cut leather and put in barrel with pumice and water and run about 10 R. P. M. and water dip lacquer.

Question No. 4—Concentration the same: What kind of agitation is best with high-current density in nickel solution?

Answer No. 4—Air and cathode agitation.

Question No. 5—What would lead acetate, or lead salt if any kind do to a nickel solution; would it cause nickel to be dark and cause peeling?

Answer No. 5—It would in quantities cause dark deposit, and large

amounts cause peeling and precipitate the nickel in the solution.

Question No. 6—When a copper solution is plating dark bronze, what is to be done to get it back to color?

Answer No. 6—It was determined from member asking question that anodes were cast and from scrap and it is presumed some phosphor copper was used, causing dark color. Best to get sheet anodes and heat and work out; this way cheapest.

Cincinnati Branch

Cincinnati Branch meeting on October 20, at the Y. M. C. A., was well attended, with a lot of pep, and hoping in the near future will have something for you to help you fill the REVIEW if it is worth while. I have the promise of one or two papers from the boys in the near future, and when I get them I will forward them to you promptly. In the meantime we have been going to it with good discussions on some finishes by different processes, but it is hard to get them together, so as soon as I can I hope to give you something.

St. Louis Branch

Our October meeting was held on the 10th, President Horath in the chair, 15 members present. It was decided to hold our tenth anniversary banquet close to January 9. E. J. Musick was appointed to arrange date at Annex Hotel.

Review of paper of Dr. Watts on "Relations of Anode and Cathode Efficiencies" made a very interesting meeting. The discussion was lead by Librarian McGinley.

A program was adopted for current season, and in addition, Mr. E. S. Weil promised to give us a talk on the "Electro-motive Theory."

1922—PROGRAM—1923

October 10—Review of paper presented at annual convention by Dr. O. P. Watts on "Relations of Anode and Cathode Efficiencies."

December 5—Determining Acidity of Solutions by Color Indicators, E. S. Weil, P. Tressider; Determining Amount of Free Cyanide in Solutions, G. S. Robins, G. Minks.

November 7—Nickel Solutions—Single vs. Double Salts, G. Lamkemeyer, G. Powitzky, T. F. Carson, William Pflueger, L. M. Hofmeister, F. C. Rushton.

January 2—Resistances of Solutions, E. W. Heil, F. Menniges, H. H. Williams; Method of Removing Carbonates, E. W. Mueller.

February 6—Brass Plating, J. H. Hartman, F. J. Strock; Spotting Out, E. J. Musick; Lacquers, J. H. Jordan, C. McGinley, H. P. Siegel.

March 6—Zinc Plating, H. Siemer, F. N. Weber, C. Sebastian; Colloids, T. E. Terrio, H. Dumas, G. Marsh.

April 3—Cleaning and Pickling, H. Eckhardt, H. Deubelbeis, G. J. Brandt, E. A. Zott, F. C. Rushton.

May 1—Generator and Electrical Equipment, F. Horath, C. Weygandt, W. J. Flannery, H. J. Richards.

In addition to above assignments every member is urged to present paper on any subject, and are also requested to make use of "Question Cards."

Toronto Branch

Toronto Branch meets every fourth Monday of each month at the Canadian Forresters' Hall, room two, 11 College street. As this was the inaugural meeting in the new hall it was decided to make this an open meeting and invite the managers and superintendents of the various plating plants to attend, and it certainly was a success. Mr. C. A. Richardson of the International Nickel Co. gave an illustrated address on the process of "Nickel From the Mine to the Anode," and the question now is, where does the impurities come from that get into the anode after the care that is taken to get them out? Mr. W. S. Barrows then followed up the subject with an address from "The Anode to the Electro Deposit," and he certainly put it over in his own inimitable style, with some fine specimens, good and otherwise, and to watch out for the Rubber ones? Mr. Bert Garrans of the Toronto University then gave us a few pointers and promised to have something to offer the boys in the near future on the nickel plating of aluminum. A vote of thanks was then extended to the several speakers, which brought to a close one of the best evenings this branch has had for some time.

Boston Branch

Boston branch met Friday, the 20th, at the American House, with Vice-President Gale in the chair. Going through the regular order of business three members were suspended. The question of appointing two members to the convention committee was taken up and Mr. Francis Mackie and Mr. Herrick were elected. The question of holding an open meeting was also taken up, but was laid over until some other time. Different discussions took place on the nickel solution for die castings, which was very good and lasted for an hour or so, when the meeting adjourned at 10:15 P. M.

Dayton Branch

The Dayton Branch held its regular monthly meeting Saturday evening, November 11, at the Y. M. C. A. After the usual business discussion Mr. R. G. Suman, President, gave a talk on "Diagnosing Silver Deposit Troubles." An interesting and instructive discussion was had by all the members and was all the more valuable because of the experience of several of the members in this work.

The Question Box discussion at the end of the talk brought out the misunderstanding and confusion which exists regarding rust-proof coatings and particularly in the use of zinc under nickel. It is hoped that in the course of the next few months this subject will be made clear through actual tests and observations.

At the invitation of the American Rolling Mills Company of Middletown, Ohio, the Dayton Branch will visit the various plants of the company. Particular attention will be paid to the Sheet Mills, Galvanizing Department, Pickling Plant, Black and Oiled Sheet Process and Research Department. The invitation has been enthusiastically received by the members and a large crowd is expected.

ELECTED TO MEMBERSHIP

Pittsburgh Branch

William F. Meyers.....518 Concord St., Corry, Pa.

Cincinnati Branch

Orville J. Enghauser.....1341 Manss Ave., Cincinnati, O.

Philadelphia Branch

Charles R. Mehl.....2201 N. 4th St., Philadelphia, Pa.

Newark Branch

Frank Dreese!.....692 S. 20th St., Newark, N. J.
Peter Labash.....268 Fairmount Ave., Newark, N. J.

Chicago Branch

Bur E. Sn'sher.....1125 E. Fox St., South Bend, Ind.
J. F. Miller.....215 W. Illinois St., Chicago, Ill.

REINSTATED

Philadelphia Branch

Jacob Liebman.....2423 S. Darien St., Philadelphia, Pa.

Chicago Branch

J. P. Carlson.....208 N. Canal St., Chicago, Ill.

APPLICATIONS FOR MEMBERSHIP

Chicago Branch

Active, Mr. Charles Barton.....4313 Church St., Jacksonville, Fla.
Active, Mr. Robert Wilson.....444 W. 5th Place, Chicago, Ill.
Active, Mr. Ramond Heingarten.....1201 Ewing St., Fort Wayne, Ind.
Active, Mr. John E. Fox.....126 S. Clinton St., Chicago, Ill.

Newark Branch

Associate, Mr. Van Winkle Todd..c|o Hanson VanWinkle Co., Newark,N.J.
Active, Mr. Karl R. Knopf.....823 W. 5th St., Plainfield, N. J.
Active, Mr. John Heim.....91 Williams St., Newark, N. J.

Detroit Branch

John Walter Paulo.....Ainsworth Manufacturing Co., Detroit, Mich.
Andrew V. Re.....Utility Manufacturing Co., Sturgis, Mich.
Carl W. Everly.....Frederickson Manufacturing Co., Saginaw, Mich.
Ray L. Shepard.....Shepard Art Metal Co., Detroit, Mich.

OBITUARY

Mr. George W. Scott of Attleboro Branch died on Oct. 27, 1922. Mr. Scott was employed by the Parker Pen Company of Jamesville, Wis., having just recently moved there with his family. We deeply regret the loss of this fellow-member of the A. E. S.

BOSTON

Regular meetings are held third Friday of each month, at 8 p. m., at the American House, Boston. Secretary, A. W. Garrett, 821 Dorchester Ave., Dorchester, Mass.

BRIDGEPORT

Meets third Friday of each month in its laboratory, 260 John St., Bridgeport, Conn. Secretary, David Fleming, 97 Roosevelt St., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., at the Hardware Club of Chicago, Room 1125. Secretary, F. J. Hanlon, 216 N. Jefferson St., Chicago, Ill.

CINCINNATI

Meets on the first and third Friday of each month, at 1262 State Ave. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets last Saturday of each month at Hotel Winton. Secretary, B. F. McCormick, 2024 Wyandotte Ave., Lakewood, O.

CONNECTICUT VALLEY

Meets on the second Tuesday of each month at 202 Washington St., Hartford, Conn. Secretary, Tennant Elwin, Newington, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, C. Van Derau, 61 Bish Ave., Dayton, Ohio.

DETROIT

Meets first Friday of each month at the Board of Commerce, Lafayette and Sheldon, at 8 p. m. Secretary, E. W. Woodmensee, 1427 Lee Place, Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., N.E. Secretary, Chas. S. Whalley, 931 Pine Ave., N.W., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at the West Side Bank Bldg. Secretary, R. Steuernagel, 1508 Concordia Ave., Milwaukee, Wis.

MONTREAL

Secretary, A. Geroux, 48 Craig West, Montreal, Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at No. 17 Central Ave., Newark, N. J. at 8 p. m. Secretary, Royal F. Clark, 71 Chadwick Ave., Newark, N. J.

NEW YORK

Meets second and fourth Fridays of each month at the Broadway Central Hotel Parlors, New York City. Secretary, John E. Sterling, 468 Grand Ave., Long Island City, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 26 Custom House St., Room 16. Secretary, C. J. Poyton, 269 Ohio Ave., Providence, R. I.

READING

Meets on the second Tuesday of each month. Secretary, William M. Fisher, 654 Gordon St., Reading Pa.

ROCHESTER

Meets every second and fourth Saturday of each month at the Hotel Seneca. Albert H. Doering, Secretary, 49 Cutler St., Rochester, N. Y.

SYRACUSE

Secretary, M. J. Crean, 109 Court St., Syracuse, N. Y.

ST. LOUIS

Meets first Tuesday of each month at Barr Branch Library, corner Jefferson and Lafayette Sts. Secretary, H. H. Williams, 4156 Botanical Ave., St. Louis, Mo.

TOLEDA

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, H. L. Myers, 410 Palmer, Toledo, Ohio.

TORONTO

Meets second Thursday of each month at Occident Hall, Bathurst and Queen Sts. Secretary, E. S. Turner, 873 St. Clair Ave., Toronto, Ontario, Canada.

WATERBURY

Meets every second and fourth Friday of each month. Secretary, Wm. Delage, 47 Prospect St., Waterbury, Conn.